

SUPPORT FOR THE AMENDMENT

This Amendment amends Claims 1, 5 and 23. Support for the amendments is found in the specification and claims as originally filed. Particularly, support for Claim 1 is found at least in Claim 16. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1, 5, 9 and 12-24 will be pending in this application. Claims 1, 5, 9 and 20 are independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the October 7, 2003, personal interview.

As discussed at the interview, the present invention is directed to a method of manufacturing a capacitor containing a vapor-deposited tantalum oxide film. Vapor-deposited tantalum oxide is amorphous, and subsequent annealing to form Ta₂O₅ typically results in loss of oxygen from the tantalum oxide and undesirable oxidation of the underlying substrate, both of which lead to inferior dielectric characteristics. However, according to the present invention, vapor-phase deposited tantalum oxide is treated with active oxygen species and annealed at a temperature below the crystallization temperature of the tantalum oxide in an inert atmosphere to produce a high quality Ta₂O₅ insulator with a high dielectric constant.

Claims 1, 5, 15-18 and 20-24 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,475,854 ("Narwankar"). In addition, Claims 9 and 12-14 are rejected under 35 U.S.C. § 103(a) over Narwankar and further in view of U.S. Patent No. 4,851,370 ("Doklan").

Narwankar discloses a capacitor structure with a Ta₂O₅ insulator separated from a Ru bottom electrode by an oxygen-containing ruthenium oxide layer, which protects the Ru

bottom electrode from oxygen diffusing from the Ta₂O₅. See, e.g., Narwankar at Abstract and column 12, Table I. Narwankar discloses in Table I a variety of different methods of annealing the Ta₂O₅ insulator

However, the Final Rejection admits that Narwankar "does not appear to specifically state that the treatment and anneal steps are both conducted in the same process, nor is an ordering of the steps specified". Final Rejection at page 3, section 5, lines 1-3.

Specifically, Narwankar fails to suggest the features of independent Claim 1 of (i) switching atmospheres during Ta₂O₅ processing from an atmosphere of *active oxygen species* to an *inert atmosphere*; and (ii) after first treating titanium oxide in the active oxygen species at a lower temperature of *300 to 500 °C*, immediately annealing the treated tantalum oxide film at a higher temperature of *620 to 690 °C*.

In addition, Narwankar fails to suggest the feature of independent Claims 5, 9 and 20 of annealing the tantalum oxide film in an *inert atmosphere* and then switching to an atmosphere of *active oxygen species*. As discussed in the specification at page 13, lines 13-16, when the tantalum oxide film is annealed before being treated with active oxygen species, the tantalum oxide film is densified to prevent active oxygen species from passing through it and reaching the underlying conductive film.

Doklan fails to remedy the deficiencies of Narwankar. Doklan is cited for disclosing multiple oxide layers. Final Rejection at page 4, section 6, lines 4-5.

Because the cited prior art fails to suggest all the limitations of independent Claims 1, 5, 9 and 20, the prior art rejection should be withdrawn.

Claims 5 and 17-18 are rejected under 35 U.S.C. § 112, second paragraph. To obviate the rejection, Claim 5 is amended by deleting at line 5 the phrase "treated with the active oxygen species,".

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Norman F. Oblon
Attorney of Record
Registration No. 24,618

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)

Corwin P. Umbach, Ph.D.
Registration No. 40,211